THE SOUTH AFRICAN SPECIES OF AIZOACEAE: XII. *SESUVIUM, TRIANTHEMA* AND *ZALEYA*

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The three genera are closely related and form part of a group within the family characterised by flowers with a superior ovary which is quite free from the perianth and which develops into a capsule with circumscissile dehiscence. The plants are herbaceous with opposite usually succulent leaves. For more than a century this group has been regarded as constituting a distinct tribe or subtribe. By most of the older writers it has been associated with Portulacaceae. The distribution is pantropical with extensions to warm temperate regions especially in the Southern hemisphere. In Africa almost all writers have recognised two genera, *Sesuvium* and *Trianthema*, as belonging to it. Both these genera were founded by Linnaeus and though closely related have been maintained as separate units by all subsequent writers. Indeed, a few have regarded them as belonging to separate families. (eg. D.Don Gen. Syst.3: 72 & 153. 1834).

With extensions of the area of botanical exploration in Africa, together with more intensive collecting, the number of described species has been considerably increased. At the same time there has arisen a certain degree of confusion as to the real limits of generic separation. Species have been variously assigned to one or the other. This confusion has been the result of reliance for generic discrimination on features that have been shown to be unreliable. To avoid this Phillips (Gen. S.Afr. Pl. ed. 2. 292. 1951) has suggested that the two genera should be merged into one, a suggestion that he himself does not adopt. Such a reduction to one comprehensive genus might be supported on grounds of convenience but is opposed to all historical usage and would involve a number of name changes, including the epithet of one or the other of the type species of the two generally accepted genera.

Recently Jeffrey (Kew Bull. 1960. 237) has resolved the generic confusion by the recognition of three genera instead of two. The genera so redefined are largely separated on the form and structure of the ovary and fruit and the three appear as relatively uniform and separable units. Jeffrey's scheme is elaborated in his revision of the species occurring in East Africa (Aizoaceae Fl. Trop. East Af. 1961) and is adopted for the S. African species in this account.

The only previous general accounts of the S. African species are those of Sonder in Fl. Cap. 2. 1862, and of Oliver in Fl. Trop. Afr. 2. 1871. Both were written at a time when the floras of the territories adjoining South Africa were almost unknown and were necessarily based on a very limited supply of material.

In this account of the S. African species a rather conservative attitude is taken on specific discrimination. All the species are at the southern limit of the geographical range of the genera. Several described local species are reduced to the status of varieties of more widespread species pending more detailed investigations.

I take this opportunity of returning sincere thanks to Mr. C. Jeffrey of Kew for much help and for many suggestions.

Subtribe **SESUVIINEAE**

K. Müll. Bot. Jahrb. 42. Beibl. 97 : 94. 1908.

Sesuvieae Reichb. Handb. 237. 1837.

Fenzl. Ann. Wien. Mus. 2 : 289. 1859 (Sub Portulacaceae).

Herbs, mostly prostrate and succulent. Stems with elongated internodes. Leaves opposite, exstipulate, usually petiolate. Perianth segments united at least at the base. Stamens attached to the perianth. Ovary superior, free from the perianth, 1- to 5-chambered: styles 1—5. Fruit a capsule opening by a transverse split.

KEY TO THE GENERA

1. Styles 2—5: ovary 2—5 chambered.
    2. Lid of fruit conical, thin-walled, falling as a whole: seeds many .. .. 1. *Sesuvium.*
    2. Lid of fruit truncate, thickened, separating as two valves: seeds 4 .. .. 3. *Zaleya.*

1. Style 1: ovary 1 or incompletely 2-chambered: lid with a thickened band: seeds 2 or 4 .. .. 2. *Trianthema.*

1. SESUVIUM.

L. Syst. Veg. ed. 10. 1058. 1759.

Diplochonium Fenzl. Nov. Stirp. Dec. 57. 1839; Ann. Wien. Mus. 2: 291. 1839.

Pyxipoma Fenzl Ann. Wien. Mus. 2: 293. 1839.

Psammanthe Hance Walp. Ann. 2: 659. 1852.

Halimus O. Kuntze Rev. Gen. 1: 263. 1891.

Prostrate succulent herbs. Leaf pairs usually unequal. Flowers usually solitary, in the forks of the stem or apparently axillary. Perianth segments 5, spreading, with a solid mucro behind the tip. Stamens 5 to numerous, where more than 5 often united in bunches or all together. Ovary 3- or 5-chambered, rarely 2: styles 2—5; ovules many, or more than 4. Fruit conical, the lid pointed, thin-walled, the lower part thickened below the line of dehiscence or all over. Seeds reniform or rounded with a prominent hilum.

The type species is *S. portulacastrum* L.

Throughout the tropics and subtropics in dry regions especially near the sea. In southern Africa confined to the northern parts especially S. W. Africa.

KEY TO THE SPECIES

1. Flowers sessile or nearly so: perianth segments united for about a third their length .. .. 1. *sesuvioides.*
1. Flowers pedunculate: perianth segments almost free 2. *portulacastrum.*

1. **S. sesuvioides** (Fenzl) Verdcourt Kew Bull. 1957. 349.

Diplochonium sesuvioides Fenzl Nov. Stirp. Dec. 58. 1839, Ann. Wien. Mus. 2: 291, 1839.
Trianthema hydaspica Edgew. J. Linn. Soc. Bot. 6: 203. 1862.
S. digynum Welw. ex Oliver Fl. Trop. Afr. 2: 586. 1871.
T. polysperma Hochst ex Oliv. l.c.
Halimus sesuvioides (Fenzl) O. Kuntze Rev. Gen. 1: 263. 1891.
S. hoepfnerianum Schinz Bull. Herb. Boiss. 5. App. 3: 75. 1897.
T. salarium Bremekamp Ann. Tvl. Mus. 15, 2: 239. 1933.

Branching prostrate herb sometimes slightly woody at the base. Stems pale coloured, stout, up to 50 cm. long, coarsely papulose at the tips, but becoming rough. Leaves slightly succulent, elliptical-oblong, the blades 0.7—2 cm. long, 0.3—1 cm. wide, often folded back on the midbrib in the younger stages; petioles 2—5 mm. long. Flowers mostly solitary, sessile or nearly so, 0.6—1.2 cm. long. Perianth segments united for about a third to half their length, the lobes acute with a mucro about 2—4 mm. long and acute downwardly directed projections between. Stamens 5—10 or more, free. Ovary 2-chambered: styles 2 or rarely 3. Fruit pointed, the lower part thickened below the line of dehiscence or all over. Seeds tuberculate.

The type *Drege* 2938 W.

Among rocks, especially in river beds. Throughout tropical Africa in the south confined to the northernmost parts.

Variable in size. A detailed study of the forms throughout their range is needed before any can be separated. *T. salarium* Bremekamp seems to differ only in having 10—15, commonly 13 stamens. The young parts are coarsely papulose, later the vesicles dry and become rough, older parts may become almost smooth.

CAPE: Namaqualand. Orange Riv. *Drege; Pearson* 6027; Anisfontein *Pillans* 5013.

S. W. AFRICA. Rehoboth. *Strey* 2529, 2192; Okavango *de Winter & Marais* 4495; Amboland *Rautanen* 560; Grootfontein *de Winter* 2986; Kahanstal *Dinter* 8190; Charlie's Puts *de Winter* 3577B; Waterberg *Bradfield* 185; Kleinfontein *Dinter* 4151; Brandberg *Liebenberg* 4977; Haikamschab *Lindney*; Hereroland *Schinz* 208; Gt. Namaqualand *Schenk* 16; "S.W.A." *Galpin & Pearson* 7676.

TVL. Zoutpansberg. Salt Pan *Bremekamp & Schweickerdt* 232; Hammanskraal *Leeman*.

2. **S. portulacastrum** (L.) L. Syst. Veg. ed. 10. 1058, 1759.

Portulaca portulacastrum L. Sp. Pl. 446. 1753.
S. repens Willd. Enum. 521. 1806.
S. pedunculatum Pers. Syn. 2: 39. 1807.
S. revolutum Pers. l.c.
S. congense Welw. ex Oliv. Fl. Trop. Afr. 2: 586. 1871.

Prostrate succulent, rooting at the nodes. Stems thick, often purple. Leaves oblong or oblanceolate, 3—8 cm. long, 0.2—0.7 cm. wide, narrowed at the base to a short petiole. Flowers solitary, pedunculate, red or purple. Peduncle 0.5—2 cm. long. Perianth 0.5—1.5 cm. long, the segments united only at the base, less than a third their length, with a mucro 4—6 mm. long at the tip. Carpels and styles 3, less often 5. Seeds many.

The type is *Hermann* BM.SL. (Herm. Parad. 262. t212).

Tropical coasts usually on sand. Recorded from Angola and from Portuguese East Africa but not, so far, from S. Africa.

2. TRIANTHEMA.

L. Sp. Pl. 223, 1753; Gen. Pl. ed. 5: 105. 1754.
Papularia Forsk. Fl. Aeg-Arab. 69. 1775.
Ancistrostigma Fenzl Ann. Wien. Mus. 2: 293. 1839.

Prostrate herbs, often annual, partially succulent. Stem with long often unequal internodes. Leaves opposite but usually unequal, petiolate, with a membranous expanded sheath. Flowers solitary or more often in groups. Perianth segments distinctly united at the base, the lobes ascending, mucronate behind the tip. Stamens 5—10, attached to the perianth. Ovary 1- or incompletely 2-chambered: style 1; stigma 2-lobed, ovules few. Fruit enclosed by the perianth, thin-walled, the lid more or less truncate, with thickened bands, the tip thin and often depressed. Seeds 2 or 4.

The type species is *T. portulacastrum* L.

Dry regions in the tropics and subtropics especially in Australia. In Africa throughout the tropics and extending southwards to the northern parts of South Africa.

The species fall under two subgenera.

KEY TO THE SUB-GENERA

1. Ovules 4: flowers mostly solitary	*Trianthema.*
1. Ovules 2, superposed: flowers in groups: leaves mostly small	*Papularia.*

Subgen. 1. **TRIANTHEMA**

Flowers mostly solitary. Ovary with 4 ovules. Leaves broadly ovate.

Only species *T. portulacastrum* L.

1. **T. portulacastrum** L. Sp. Pl. 223. 1753.

T. monogyna L. Mant. 1: 69. 1767.

Prostrate slightly succulent herb, the young parts shortly hairy. Leaves large, petiolate, the lower 2—4 cm. diam., almost orbicular, the upper smaller, broadly ovate, obtuse: petioles about half as long as the blades. Flowers solitary, sessile or very shortly pedicellate. Perianth 4—6 mm. long, the tube longer than the acute lobes. Stamens about 10. Ovary truncate: style 1. Seeds compressed, rounded, with "ammonite-like" markings.

The type is *Hermann*. BM. SL. (of Jeffrey Kew Bull. 1960. 236.) A cosmopolitan weed of the tropics. Recorded from Portuguese East Africa at Inhaca Island but, so far, not further south.

Subgen. 2. **PAPULARIA** (Forsk.)

Jeffrey Kew Bull. 1960. 237.

Forsk. Fl. Aeg-Arab. 69. 1775. (pro gen.)

Flowers small, in clusters. Ovary 1- or incompletely 2-chambered: Ovules 2, superposed. Small plants. Leaves not over 0.5 cm. wide.

The type species is *T. crystallina* (Forsk.) Vahl, Sym. Bot. 1: 32. 1790.

Key to the Species

1. Perianth lobes at least as long as the tube .. .. .. 2. *salsoloides.*
1. Perianth lobes shorter than the tube
  2. Smooth: perianth lobes acute or acuminate .. .. 3. *parvifolia.*
  2. Hispid: perianth lobes obtuse or subobtuse .. .. 4. *triquetra.*

2. **T. salsoloides** Fenzl ex Oliv. Fl. Trop. Afr. 2: 588. 1871.

Prostrate. Leaves narrow, shortly petiolate, the sheaths with lateral projecting teeth. Flowers in clusters on the main stem and short lateral branches. Perianth less than 5 mm. long. campanulate, the lobes ascending, at least as long as the tube. Fruit more or less flat-topped the lid with a thickened circular ring.

The type is *Kotschy* 137 (Nubia) K.

A variable species of which three distinct varieties are recognisable within the area.

Key to the Varieties

1. Stems hispid: leaves oblong-lanceolate: perianth lobes much longer than the tube .. ..
  2. Flowers 3 mm. long.: densely crowded: perianth lobes with a short mucro: leaves deciduous at flowering time .. *salsoloides.*
  2. Flowers 4—6 mm. long, in small groups: perianth lobes with a long mucro: leaves persistent .. .. .. *transvaalensis.*
1. Stems smooth: leaves linear: flowers 3 mm. long: perianth lobes with broad membranous margin .. .. .. *stenophylla.*

var. 1. **salsoloides**. Coarsely papulose, becoming hispid when older. Stems woody at the base. Leaves thick, rolled, those on the main shoots deciduous at flowering time: blades lanceolate, 1·5—2·5 cm. long, 0·2—0·3 cm. wide: petiole short. Flowers densely crowded, especially on short lateral branches, about 3 mm. long, densely hispid. Perianth lobes 2—3 times as long as the tube, with narrow brownish margins and a short mucro. Lid of the fruit with a prominent smooth thickened ring.

Throughout tropical Africa but not collected in the south.

var. 2. **transvaalensis** (Schinz) Adamson comb. nov.

T. transvaalensis Schinz Mitt. Bot. Mus. Zurich 60: 396. 1915 (pro sp.).

Diffuse or ascending. Stems up to 50 cm. high, the younger hispid-papulose, the older glabrescent: internodes 2—5 cm. long. Leaves linear-oblong, 1—2 cm. long, 2—3 mm. wide: petiole 3—4 mm. long: sheath with 2—3 teeth at each side. Flowers on very short lateral branches, in clusters of 3. Perianth 4—6 mm. long, the acuminate lobes twice as long as the tube, with a narrow margin, a long mucro and small obtuse projections between. Fruit as in var. *salsoloides*.

The type is *Schlechter* 4876 Z.

Apparently confined to the northern Transvaal, S. Rhodesia and adjacent territories.

TVL. Zoutpansberg. Madsaba *Schlechter* 4876; Dongola *Codd* 4862. Pietersburg. Magoeba's Kloof *Pott* 4785; Lydenburg. Groenlands *Barnard & Mogg* 1044; Pilgrims Rest. Leeuwpan *Acocks* 16749.

Var. 3. **stenophylla** Adamson var. nov.

A typo differt caulibus foliisque laevibus, foliis linearibus, floribus congestis in ramis floriferis brevissimis, lobis perigonii acutis late marginatis.

More slender than the other varieties with smooth stem and leaves. Leaves narrow, often rolled. Flowers crowded on very short lateral branches. Perianth lobes twice as long as the cup-like tube, acute, with rather broad membranous margins and small bulges between. Style with a broad 2-fid stigma.

The type is *v. d. Schijff & Marais* 3734 K. (isotype PRE)

Only recorded from the northern Transvaal.

Zoutpansberg. Soutpan *Meeuse* 10583; *Schweickerdt & Verdoorn* 459.

Kruger Nat. Pk. *v. d. Schijff & Marais* 3734.

3. **T. parvifolia** Sond. Fl. Cap. 2: 596. 1862.

T. triquetra Willd. subsp. *parvifolia* Jeffrey Kew Bull. 1960. 237.

T. crystallina auct. non Vahl (e.g. Sonder l.c.).

T. hereroensis Schinz Bull. Herb. Boiss. 5. App. 3: 76. 1897.

Prostrate, glabrous, shining, herbaceous or slightly woody at the base. Stem usually with unequal internodes. Leaves small, smooth, more or less succulent, petiolate: blades oblong to subrotund, obtuse. Flowers small, 1·5—2 mm. long, few or many, usually crowded. Perianth lobes acute, not longer than the obconical tube. Stamens 5. Style 1, with a bifid stigma. Fruit tapering to the base, the lid truncate-conical, with a thickened ring and thin depressed apex. Seeds 2, or solitary by abortion.

Dry regions through southern tropical Africa. In the Republic in the N.W. Cape and S.W. Africa.

Perennial but often behaving as an annual. A very variable species with several distinctive varieties. The descriptions and differentiation of these has been much confused by the misidentification of some of them as *T. crystallina* (Forsk.) Vahl. This commenced with Sonder (l.c.) and has been copied by all subsequent S. African workers. The true *T. crystallina* (Forsk.) Vahl is a plant found in N.E. Africa and S.W. Asia but not in central or southern Africa.

Key to the Varieties

1. Inflorescence compact, umbellate.
   2. Inflorescence with 5—15 ascending flowers.
      3. Internodes unequal: perianth lobes much shorter than the tube: fruit lid with a narrow ring .. .. var. 1. *parvifolia.*
      3. Internodes equal: stems with distinct scars of leaves: perianth lobes about as long as the tube: lid of fruit with a broad thickened ring .. .. var. 3. *annulata.*
   2. Inflorescence many-flowered, spherical or hemispherical: lid of fruit with a small ring .. .. var. 2. *rubens.*

1. Inflorescence lax, with forking branches: lid of fruit with a broad ring .. .. var. 4. *corymbosa.*

Var. 1. **parvifolia.**

Stems up to 40 cm. long, with internodes 1—3 cm. long. Leaves with obtuse oblong or obovate blades, 3—12 mm. long, 2—3 mm. wide: petiole about as long as the blade: sheath broad. Inflorescence with 3—15 flowers, commonly about 10, the flowers sessile, contiguous, facing upwards. Bracts membranous, broad, obtuse or acuminate-apiculate. Perianth lobes triangular, membrane-edged, with a minute mucro behind the tip, about half as long as the smooth tube. Lid of the fruit truncate-conical, with a narrow thickened ring half way between the edge and the tip.

The type is *Drege* (Gamka Riv.) S.

Very variable in size and amount of branching. Flowers usually pinkish.

T. hereroensis Schinz. (type *Staph* Z.) seems to differ only in having larger leaves and flowers, and perianth lobes with an elongated mucro.

S.W. AFRICA: Keetmanshoop *Theron* 1993; Sandverhaar *Pearson* 4370; Waterberg *Bradfield* 188; Narudas Sud *Pearson* 8581; Gabis *Pearson* 4330; Maltahoe *Macdonald* 373.

CAPE: Namaqualand. Springbok *Zeyher* 633; Gt. Rozynbosch *Pearson* 3826; Prieska, Prieska *Bryant* 203, J203; Herbert. Douglas *Acocks* 1901; Prince Albert. Boterkraal *Bolus* 11516; Laingsburg, Gamka Riv. *Drege.*

Specimens, *Verdoorn* 1318, from Fauresmith O.F.S., probably belong here but differ in having many-flowered inflorescences.

Var. 2. **rubens** (Sond.) Adamson comb. nov.

T. crystallina var. *rubens* Sond. Fl. Cap. 2: 598. 1862.

Most often red. Stems rather woody, with internodes 0·7—3 cm. long. Leaves with oblong blades, about 5 mm. long and 2.5 mm. wide, longer than the petioles: sheaths toothed. Inflorescences on the main shoot and crowded on short lateral branches, many-flowered, spherical or hemi-spherical, shortly pedunculate, the flowers spreading all round. Perianth lobes with narrow membranous edges, about half as long as the tube. Lid of the fruit with a small thickened ring near the tip.

The type is *Drege* (Verleptpram) S.

The leaves often fall about the fruiting stage. Flowers dark red.

S.W.A. Okahandja *Dinter* 318.

CAPE. Namaqualand. Orange Riv. *Drege*: Iaus *Schlechter* 11420; Kenhardt. Kakamas *Wasserfall* 1041.

Also in Angola.

Var. 3. **annulata** Adamson var. nov.

A typo differt caulibus annulatis internodiis aequilongis, foliis granuloso-papulosis mox deciduis, floribus congestis, lobis perigonii tubo subaequilongis, operculo fructus late annulato.

A small succulent. Stems red, forking, marked by ring-like white scars 0·5—0·8 cm. apart: internodes equal. Leaves deciduous except on the youngest parts, finely granular-papulose: blades oblong to subrotund, 4—7 mm. long, 3—4 mm. wide, as long as the petioles. Flowers crowded. Perianth lobes with very narrow membranous edges and a short mucro, about as long as the tube. Lid of the fruit with a broad thickened band half to two-thirds the diam. and a small apical depression.

The type is *Pearson* 9231. K.

Stems woody at the base, the younger succulent, red, marked by distinct equidistant scars of the leaves.

S.W.A. Achterfontein *Pearson* 9231; Gt. Fish Riv. *Pearson* 9287.

CAPE. Kenhardt. Bladgrund. *Comins* 657.

Also in Angola.

Var. 4. **corymbosa** (Sond.) Adamson comb. nov.

T. crystallina var. *corymbosa* Sond. Fl. Cap. 2: 598. 1862.

Larger than the other varieties. Stems branched, with internodes up to 4·5 cm. long. Leaves less succulent, the blades oblong 5—13 mm. long, 3—4 mm. wide, slightly longer than the petioles: sheaths obtusely angled. Inflorescence rather lax, 5—15-flowered, with distinct forking pedicels. Bracts acuminate. Perianth lobes about as long as the tube, with very narrow membranous edges. Lid of the fruit thickened except for a small apical portion.

The type is *Drege* (*T. corymbosa* EM) S.

Possibly a separate species but the available material is scanty.

Orange River Valley. *Drege*; *Pearson* 5989.

Also in Angola.

4. **T. triquetra** Rottl. ex Willd. Ges. Nat. Fr. Neu. Sch. 4: 181. 1803.

T. sedifolia Vis. Pl. Aeg. Nub. 19. t.3 f.1 1836.

Like *T. parvifolia* but densely covered all over with prominent papillae becoming hard and hispid in the older stages. Stems ridged. Leaves larger with short petioles. Flowers with the perianth lobes half as long as the tube, the lobes obtuse or subobtuse.

Tropical Africa. Recorded from Bechuanaland and S. Rhodesia but not, so far, from S. Africa.

3. ZALEYA

Burm. f. Fl. Ind. 110. t.31. 1768.

Rocama Forsk. Fl. Aeg.-Arab. 71. 1775.

Large herbs with the habit of *Trianthema*. Flowers in groups. Ovary 2-chambered with 2 ovules in each chamber: styles 2. Fruit truncate, flat-topped, the lid thickened, more or less 2-lobed, with the lobes separating as 2 valves at dehiscence.

The type species is *Z. decandra* Burm.f.

1. **Z. pentandra** (L.) Jeffrey Kew Bull. 1960. 238.

Trianthema pentandra L. Mant. 1. 71. 1767 (cf. Melville Kew Bull. 1952. 211).

Rocama prostrata Forsk. Fl. Aeg. Arab. 71. 1775.

A many-stemmed prostrate or ascending rather coarse herb more or less woody at the base. Young parts covered with short rough hairs, the older glabrescent. Leaves opposite, usually unequal, petiolate, finely papulose: blades elliptical or oblong, usually obtuse, 1·5—3 cm. long, 0·7—1 cm. wide: petioles 0·4—0·8 cm. long, with a narrow entire sheath at the base. Flowers in crowded groups of 5—20, sessile or nearly so. Perianth 3—5 mm. long, the segments united for about half their length, the lobes parallel sided, subacute, shortly mucronate, with narrow membranous edges. Stamens 5. Ovary truncate, the top flat, with 2 obtuse bulges. Fruit about as long as the perianth, splitting about a third from the base along a smooth thickened rim, the flat-topped lid with 2 broad angles that separate as valves. Seeds 4, stout-reniform, sulcate.

The type is in herb. *Linn.* (572: 2).

Most common on rocks in dry river beds. Throughout tropical Africa, in S. Africa confined to the N.E. regions.

TVL. Zoutpansberg. Punda Maria *Codd* 6005; Soutpan *Schweickerdt & Verdoorn* 546; Potgietersrust. P.G.R. *Leendertz* 1885; Immerpan

Comins 911; Rustenburg. Swartruggens *Acocks* 19171; *Sutton* 946; Pretoria. Aapies Riv. *Schlechter* 3612: Rooiplaat *Leendertz* 776; Nelspruit. Komatipoort *Schlechter* 11793; Barberton. Avoca *Thorncroft* 2270.

SWAZILAND. Hlatikulu *Stewart.*

NATAL. Zululand. Mkuzi *Galpin* 13654.

CAPE. Kimberley. Boshof road. *Acocks* 1893 (? indigenous).